Public Safety Communications Research

Public Safety Broadband Demonstration Network

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Public Safety Communications Research Program

Located at the Department of Commerce Boulder Labs in Colorado

The PSCR Program is a joint effort between

NIST's Office of Law Enforcement Standards (OLES)

and

NTIA's Institute for Telecommunication Sciences (ITS)

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PSCR Program Sponsors

Department of Homeland Security

Department of Justice

SAFECOM

Office for Interoperability and Compatibility (DHS/OIC)

COPS

Community Oriented Policing Services

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Demonstration Network Background

- Public Safety licensed to use 700MHz spectrum but there were no government or independent laboratory facilities to test and demonstrate the public safety specific broadband implementation requirements
  - PSCR entered into Cooperative Research and Development Agreements (CRADAs) with industry to:
    - provide manufacturers with a site for early deployment of their public safety broadband systems
    - opportunity to evaluate them in a multi-vendor environment with focus on interoperability
    - create integration opportunities for commercial service providers
  - *Waiver Order*, FCC 10-79, May 12, 2010, ¶59-61: requires waiver recipients to certify their vendors are actively participating in the PSCR Demonstration Network

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CRADA Partners

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System Testing

- System test plans developed with three major phases
- Phase 1: Basic Functionality Testing
  - determine if LTE equipment submitted for use in the demonstration network configured correctly to achieve a minimal level of functionality:
    - Physical layer tests to ensure that the submitted equipment will not interfere with other existing 700 MHz LMR, PSCR demonstration systems
    - Messaging/protocol tests
    - Public safety application tests
    - Basic performance tests

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System Testing (cont.)

- Phase 2: System and Node Level Testing
  - Phase 2.1
  - Physical Layer Tests
    - Examine several characteristics of the eNB that will indicate how equipment will operate in PS scenarios
    - Provides indication of sensitivity level and robustness for the RF section of the eNB
  - Throughput Performance Tests
    - Tests examine throughput in bidirectional, downlink and uplink configurations.
    - Test configurations examine both TCP and UDP throughput.
  - Messaging/Protocol Tests
    - examines the messaging behavior of the LTE system in the event that an additional radio bearer is requested

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System Testing (cont.)

- Phase 2.2
  - Stress Tests
    - Examine loading and potential capacity of the cell / loaded network stress testing
  - Performance Tests
    - Examine user-plane latency
  - Messaging/Protocol Tests
    - Examine security, interoperability, and failure modes
    - Security tests focus on intrinsic security modes in LTE as opposed to Over the Top (OTT) methods that may be used at higher levels in the protocol stack.
  - Network O&M - Alarm/Fault Reporting
  - "Status Info Homepage"- Evaluate a standardized mechanism to quickly inform the user of system information

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System Testing (cont.)

- Phase 3: Advanced Feature, Conformance, Interoperability, and Roaming
  - Network architecture testing
    - Evaluation of various PLMN, eNUM and IP implementations
  - Interoperability Testing
    - EPC testing and inter-connecting multiple EPCs
    - Basic RAN interoperability testing – Ue and eNodeB
  - Roaming/Handover testing and evaluation (pending UE availability)
    - LTE-to-LTE (public safety-to-public safety)
    - LTE-to-LTE and 3G (PS to commercial)
  - Stress, performance, messaging/protocol, and application testing

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UE Testing

- UE testing covers several key aspects
  - RF Conformance & Performance tests based on several key documents
    - 3GPP 36.521-1 v8.4.0 (Dec 2009)
    - PTCRB RFT #76
  - Radio Resource Management (RRM) Conformance Testing
    - 3GPP 36.521-3 v8.4.0 (Dec 2009)
  - Scenario Based Tests
    - Based upon Verizon Wireless Device Requirements LTE 3GPP Band 13 Network Access Issued May 2010 v4.0
  - Field Performance Tests
    - Verizon Wireless Device Requirements LTE 3GPP Band 13
    - GSMA DG.11 Device Field and Lab Test Guidelines, Version 8.0, 11 June 2010, Annex C

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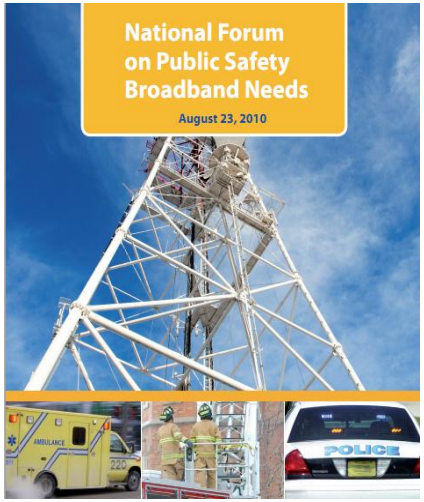
Requirements Development

- PSCR chairs the NPSTC Broadband Working Group
  - 200+ public safety members
  - Developed the *700MHz Broadband Statement of Requirements*
  - Defined Mission Critical Voice

- PSCR leads 5 BBWG Task Groups
  - Local Control
  - Multimedia Emergency Services
  - Priority/Quality of Service
  - Security
  - Mission Critical Voice

- PSCR is active in other public safety broadband requirements gathering efforts
  - PSST Operators Advisory Council
  - APCO Broadband Working Group
  - DOJ's National Forum on Public Safety Broadband Needs



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Standards and Specifications Organizations

PSCR has historically provided insight and direction to IT and wireless standards committees that are developing standards for voice, data, image, and video communication specific to public safety. PSCR's work is currently focused in these SDOs:

The **3rd Generation Partnership Project (3GPP)** produces the technical standards and specifications for LTE, uniting numerous telecommunications standards bodies under one group.

- PSCR is a member of 3GPP and represents public safety's requirements
- PSCR has introduced a work item into 3GPP to address Direct Mode (Proximity Services) communications

The **Alliance for Telecommunications Solutions (ATIS)** is the North American standards body representative in 3GPP.

- PSCR is a member of ATIS and represents public safety's requirements
- PSCR has created an issue statement that would give the ATIS WTSC the ability to work on public safety specific issues

The **GSM Association (GSMA)** is an association of mobile operators and related companies that support the standardization of the GSM system.

- PSCR is actively seeking membership to GSMA in order to represent public safety's requirements to their Voice over LTE (VoLTE) initiative

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Formal Testing Organizations

PSCR leveraging the commercial cellular testing organizations where applicable. Not re-creating testing efforts that can be leveraged by public safety. PSCR is developing inputs and public safety recommendations for these formal testing organizations:

The **PCS Type Certification Review Board (PTCRB)** was created by network operators to provide an independent evaluation process for cellular devices.

- PSCR worked with PTCRB to change rules in order to allow public safety involvement in the group
- PSCR has also submitted an initial list of tests for Band Class 14 devices.
- Based on this list, PTCRB has identified official test equipment and laboratories are preparing to certify Band Class 14 devices

The **MultiService Forum (MSF)** is an organization of service providers and equipment vendors charged with interoperability testing of cellular infrastructure.

- PSCR is working with MSF to understand how other segments of the cellular industry are performing interoperability testing
- Public safety can then leverage this process or model a process similar on best practices from industry

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Demo Network Testing Status

- Lab and Over-the-Air public safety trial network currently live in Boulder, Colorado at 3 sites: 2 fixed sites and 1 Cell on Wheels (COW)
- Cooperative Research And Development Agreements (CRADA) executed with 35+ companies
- EPC and RAN vendors executing Phase 1 & 2 test plans
- UE (device/handset) vendors undergoing pre-PTCRB tests for RF and signaling conformance
- Results/Lessons Learned from Phase 1 testing on track for release at March PSCR Stakeholder meeting

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For Additional Information:

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